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Jalbert, Terrance; Stewart, Jonathan; Landry, Steven P.

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Terrance Jalbert
is a Professor of Finance at the University of Hawaii at Hilo. His research appears in journals including: *International Journal of Finance*, *Journal of Applied Business Research*, *The International Journal of Business and Finance Research*, *Financial Services Review*, *Latin American Business Review* and *Journal of Accounting Education*.

200 West Kawili Street, Hilo, HI 96720, USA
Tel: +1 808-974-7456; E-mail: jalbert@hawaii.edu

Jonathan Stewart
is Professor of Finance at Abilene Christian University. He is a CFA charterholder and has published articles in *The Journal of Financial Research*, *The Journal of Investing* and *The Economic Review of The Federal Reserve Bank of Atlanta*. He has recorded a series of podcasts on finance and investing called *Stewllenium Radio*.

158 Mabee Business Building, ACU Box 29313, Abilene, TX 79699, USA
Tel: +1 (325)674 2133; E-mail: stewartjo@acu.edu

Steven P. Landry
is a Senior Lecturer in Accounting at the Naval Postgraduate School. His research appears in journals including *Journal of Theoretical Accounting Research*, *Journal of Applied Financial Research*, *Journal of Business & Economics Research*, *Journal of Diversity Management*, *International Business & Economics Research Journal*, *Journal of Finance Case Research* and *Journal of Corporate Accounting and Finance*.

Graduate School of Business and Public Policy, Monterey, CA 93943, USA
Tel: +1 (831) 647 6407; E-mail: splandry@nps.edu

Abstract Canada Post issued the first permanent stamp on 16th November, 2006. The United States Postal Service soon followed by introducing the forever stamp on 12th April, 2007. The stamps were developed to ease the transition associated with increases in postal rates. The stamp price equals the one-ounce cost of first-class postage at the time of purchase. The stamp allows consumers to receive services equal to the value of a first-class postage stamp at the time of use. Permanent stamps are unique given their insensitivity to postal rate increases, thereby offering the potential to hedge against future postage rate increases. Moreover, postal services commonly pre-announce rate changes providing a several week notice before the change takes effect. The careful treasury manager conceivably can minimise mailing costs around postal increases by strategically purchasing permanent and forever stamps. Indeed, the enterprising entrepreneur might make a market by purchasing stamps prior to the rate change and selling them after for the new going rate. In this paper the authors develop a model to determine optimal stamp purchases around postal rate increases. The results indicate it is optimal for most individuals to purchase between a 90- and 730-day supply of permanent postage when a $0.01 increase in postage rates is imminent. From a policy perspective, the results imply that postal authorities should monitor permanent stamp purchase patterns to determine the optimal timing and magnitude of postal rate increases.

Keywords: hedging, postage rates, forever stamps

INTRODUCTION

Many countries offer some form of forever stamp. The US forever stamp was first introduced on 12th April, 2007, with a purchase price of $0.41.The US Postal Service (USPS) issued only one version of the stamp, the Liberty Bell stamp, until 21st October, 2010, when a second version of the stamp was introduced. Effective 22nd January, 2011, all USPS first-class one-ounce stamps are issued as forever stamps.[1] So users no longer have to choose between buying a forever stamp or a commemorative or holiday stamp which many users find to be more aesthetically pleasing. Since their first issue, US forever stamps have been used extensively as there are few advantages to purchasing standard stamps. From a financial standpoint the only reason one would purchase a standard non-forever stamp is if the purchaser expects a postage rate decrease, an unlikely event.

The forever stamp allows consumers to receive services equal to the cost of a first-class stamp at the time of use. The cost equals the price of a one-ounce first-class stamp at the time of purchase. Therefore the purchaser of a forever stamp is able to lock in shipping costs at the prevailing postage rate at the time the stamp is purchased. Postal services announce rate changes in advance allowing the careful treasury manager to advantageously time postage purchases. While permanent stamps are based on first-class postage rates, they may be used for any type of shipment. Regardless of the type of shipment, the user receives services equal to the cost of a first-class stamp at the time of use. Locking in the cost of shipping is particularly desirable when the Postal Service has announced a rate increase. In these instances, the user is able to lock in a guaranteed return by purchasing the stamp just prior to the rate increase for use after the rate increase takes effect. The issue addressed in this paper is how many forever stamps a user should purchase prior to a rate increase. The optimal purchase amount is dependent on the amount of the announced postage increase, the amount of shipping done by the business or individual, the level of postage rates and the individual's discount rate. In addition, larger firms should consider the cost of adding labour assuming that rate meter machines are unable to process 'forever' postage.

Postal services clearly have their own motivations for issuing forever stamps. According to an audit report from the office of the Inspector General of the USPS, forever stamps provide some benefits to the USPS that denominated stamps do not.[2] Specifically, an audit indicates that 90 per cent of denominated stamps are used within one year of purchase. Often usage of denominated stamps occurs immediately. The audit implies that forever stamps are not typically used as quickly. For both types of postage, some stamps are never used. The USPS refers to this phenomenon as 'breakage' and could occur as a result of stamps being accidentally destroyed, lost or purchased by collectors who never intended to use them for postage. The audit estimates that there is about US$2.445bn of unused postage in the hands of consumers as of 2010. Regardless of the reasons, it appears forever stamps are held by consumers for longer periods of time prior to use. This phenomenon makes forever stamps advantageous for the postal service. Forever stamps also

benefit the postal service by reducing the need to print and distribute large numbers of small denomination stamps needed by holders of denominated postage around a rate increase.

The USPS has sold more than 6bn forever stamps. Rational agents attempting to minimise their mailing costs are expected to increase permanent stamp purchases before announced rate increases. Clearly consumers realise the potential advantage associated with purchasing the stamps. The Postal Service printed 1.5bn stamps to accommodate the demand leading up to the 12th May, 2008 increase of US$0.01. The Postal Service sold US$115.3m, US$207.9m, and US$267.6m of the stamps in January, February and March of 2008 leading up to the 12th May, 2008 increase. Furthermore, as of 28th April, 2008, approximately 30m forever stamps were being sold each day.[3]

While consumers have demonstrated their demand for forever stamps, little information is known about the optimal number of forever stamps an individual or business should purchase during the period between the announcement of a postal rate increase and the effective date of that increase. This paper explores this issue in detail. It is important to note that larger businesses generally use metered mail. However, in the US, metered mail does not benefit from the forever stamp rate lock provision. Thus, the results presented here are more relevant for smaller organisations until such time as postal services implement forever stamp type of products for metered and other classes of mail. This point is discussed later in the paper.

The remainder of the paper is organised as follows. In the next section the relevant literature is discussed. This section is followed by the development of a model to determine optimal forever stamp purchases in the time period leading up to a postage rate increase. The paper closes with some concluding comments.

BACKGROUND AND LITERATURE REVIEW

The USPS was created on 26th July, 1775. The Postal Reorganization Act of 1970 reorganised the Postal Service to its current form as an independent agency of the US Government. The Post Office Department of the Government of Canada was founded in 1867. The department was rebranded in the 1960s as Canada Post (CP). On 16th October, 1981 the Canada Post Corporation Act gave CP the opportunity to reorganise as a Crown Corporation giving it certain elements of independence from the Canadian Government.

Both the USPS and CP have increased postal rates at fairly regular intervals since their inception. USPS rates were initially based on the number of miles the communication was to be carried. On 3rd March, 1863 the modern framework for pricing was developed. Panel A of Table 1 shows the history of USPS first-class postage rates on one-ounce, standard-shaped letters. The history of postage rate changes of CP is presented in Table 1 Panel B. Moving to the present, however, forever and permanent stamps have changed the landscape of postage rates quite possibly forever.

Futures contracts are available for physical commodities, currencies, interest rates and stock indices[4] and are often used to hedge against price changes in these types of assets. Forward contracts, similar to futures contracts but

not publicly traded, are also regularly used to hedge against price changes in the underlying asset.

The purchase of a forever stamp is similar to the purchase of a futures contract against a future need for postage. Nevertheless, there are several important differences. In a standard futures contract, the price and quantity of the good to be delivered in the future is determined at the outset of the contract. With the exception of a security deposit, no money is transferred until maturity of the contract. In the case of forever stamps, the full price is paid for future services at the outset of the contract. Another important difference is that futures contracts have a finite maturity. Forever stamps, as the name implies, do not have a stated maturity or expiration date. The purchaser of the stamp determines the effective maturity of the contract via actual use of the stamp. No known academic literature explicitly examines issues associated with the forever stamps and their properties as a hedge against future postage rate increases. Due to this lack of literature, the analysis is related to the literature on hedging using futures markets.

Many papers analyse the effectiveness of hedges in various markets. A number of papers examine real estate and other assets as a hedge against inflation. A recent paper notes that real estate hedging has become increasingly possible with the recently introduced Chicago Mercantile Exchange (CME) real estate futures contract.[5] The authors found that CME futures had the potential to reduce house price risk by more than 88 per cent for some classes of investors over the time period 1994–2006. Other authors examine real estate as a hedge against inflation. They found in general that real estate was a good hedge against inflation, but some classes of real estate were better hedges than others, with a business real estate portfolio having the best hedging properties.[6] Another group of authors examined the use of real estate in various countries as a hedge against inflation with the general finding that international real estate has also served well in this capacity.[7,8]

Chang Lai and Chuang examined the effectiveness of hedging in the energy markets using eight hedging models.[9] The authors found that hedging effectiveness was better in a bull market than a bear market. They found this result held consistently across the most popular hedging models. Alizadeh, Nomikos and Pouliasis examined hedge ratios in the New York Mercantile Exchange oil futures markets.[10] They found that state dependent hedge ratios provided significant reductions in portfolio risk. Yun and Kim examined hedging effectiveness in the Korean oil trading market.[11] They found that considering both commodity pricing and exchange rate variations improved hedging effectiveness.

Futures markets are constantly evolving through the introduction of new contracts and periodic retirement of others. One relatively new futures contract relates to freight transportation. This market has historically focused on ocean transportation. Yet, recently some authors have proposed futures contracts on land-based freight movements.[12] Intrade (www.intrade.com) offers futures products related to many events and outcomes such as politics, foreign affairs, current events and natural disasters. The forever stamp represents

Table 1: History of first-class postage rates

This table shows one-ounce first-class postage rate changes. Panel A shows rate changes by the USPS from 3rd March, 1863 until 20th April, 2011 in US dollars. Panel B shows rate changes by CP from 1st April, 1943 until 20th April, 2011 in Canadian dollars. The first column indicates the date of the change. The second column shows the first-class postage rate after the change. The third column shows the change amount and the fourth shows the percentage change. Column five indicates the number of days between rate changes.

Panel A: USPS Rate Changes					Panel B: CP Rate Changes				
Date	Rate	Change	Change %	Days	Date	Rate	Change	Change %	Days
March 3, 1863	0.03				April 1, 1943	0.04			
March 3, 1883	0.02	–0.01	–33.33	7,305	April 1, 1954	0.05	0.01	25.00	4,018
November 13, 1917	0.03	0.01	50.00	12,673	November 1, 1968	0.06	0.01	20.00	5,328
July 1, 1919	0.02	–0.01	–33.33	595	January 1, 1971	0.07	0.01	16.67	791
July 6, 1932	0.03	0.01	50.00	4,754	January 1, 1972	0.08	0.01	14.29	365
August 1, 1958	0.04	0.01	33.33	9,522	September 1, 1976	0.10	0.02	25.00	1,705
January 7, 1963	0.05	0.01	25.00	1,620	March 1, 1977	0.12	0.02	20.00	181
January 7, 1968	0.06	0.01	20.00	1,826	April 1, 1978	0.14	0.02	16.67	396
May 16, 1971	0.08	0.02	33.33	1,225	April 1, 1979	0.17	0.03	21.43	365
March 2, 1974	0.10	0.02	25.00	1,021	January 1, 1982	0.30	0.13	76.47	1,006
December 31, 1975	0.13	0.03	30.00	669	February 15, 1983	0.32	0.02	6.67	410
May 29, 1978	0.15	0.02	15.38	880	June 24, 1985	0.34	0.02	6.25	860
March 22, 1981	0.18	0.03	20.00	1,028	April 1, 1987	0.36	0.02	5.88	646
November 1, 1981	0.20	0.02	11.11	224	January 1, 1988	0.37	0.01	2.78	275
February 17, 1985	0.22	0.02	10.00	1,204	January 1, 1989	0.38	0.01	2.70	366
April 3, 1988	0.25	0.03	13.63	1,141	January 1, 1990	0.39	0.01	2.63	365
February 3, 1991	0.29	0.04	16.00	1,036	January 1, 1991	0.40	0.01	2.56	365
January 1, 1995	0.32	0.03	10.34	1,428	January 1, 1992	0.42	0.02	5.00	365
January 10, 1999	0.33	0.01	3.12	1,470	January 1, 1993	0.43	0.01	2.38	366
January 7, 2001	0.34	0.01	3.03	728	August 1, 1995	0.45	0.02	4.65	942
June 30, 2002	0.37	0.03	8.82	539	January 1, 1999	0.46	0.01	2.22	1,249
January 8, 2006	0.39	0.02	5.40	1,827	January 1, 2001	0.47	0.01	2.17	731
May 14, 2007	0.41	0.02	5.12	491	January 14, 2002	0.48	0.01	2.13	378
May 12, 2008	0.42	0.01	2.43	364	January 12, 2004	0.49	0.01	2.08	728
May 11, 2009	0.44	0.02	4.76	364	January 17, 2005	0.50	0.01	2.04	371
					January 16, 2006	0.51	0.01	2.00	364
					January 16, 2007	0.52	0.01	1.96	365
					January 12, 2009	0.54	0.02	3.85	727
					January 11, 2010	0.57	0.03	5.55	364
					January 17, 2011	0.59	0.02	3.51	371

yet another innovation in futures markets.[13] This paper applies the fundamental financial principles of the time value of money and the cost of capital to determine the optimal use of forever stamps. The idea is to identify a purchase strategy of forever stamps that will maximise the buyer's net present value. The test is to ensure the cost variables inherent in the decision have been properly identified and that the firm has applied the appropriate weighted average cost of capital (WACC).

THE MODEL

In this section a model is developed to help individuals and businesses determine the optimal amount of permanent stamps to purchase prior to a rate increase. In this model, the optimal purchase amount depends upon the rate

increase amount; the level of postage rates; the volume of mail sent by the business or individual; and the discount rate that the user applies to cash flows. Futures contracts are normally valued using the cost of carry model. Defining the pre-change postage rate as CR_o, the post-change rate as FR_t and the return for carrying the commodity from purchase day to use day as $C_{o,t}$, the cost of carry model is specified using equation 1:

$$F_t = C_0(1 + C_{0,t}). \quad (1)$$

Rearranging equation 1 to solve for $C_{0,t}$ yields:

$$C_{0,t} = \frac{F_t}{CR_0} - 1. \quad (2)$$

The computations are demonstrated for a postage rate increase from \$0.42 to \$0.44 which was the most recent change in USPS rates. For a postal rate increase from \$0.42 to \$0.44, the return for carrying the commodity is:

$$C_{0,t} = \frac{0.44}{0.42} - 1 = 4.76\%.$$

The interpretation of this figure is that the consumer earns a 4.76 per cent return by purchasing a permanent stamp prior to a postal rate increase and using it after the rate increase. Consumers with a cost of capital lower than 4.76 per cent over the relevant time period should purchase the stamps. The carry returns for other rate increases are reported in Table 2.

While returns for carrying the commodity are insightful, more can be said. Carrying returns represent the return over the period of investment. Identifying an appropriate cost of capital for comparison may prove difficult for many individuals. Some consumers identify more readily with returns over an annual period. To accommodate these individuals, the annualised return is computed. An investor receives the annualised return if they repeat the investment regularly throughout a year, or finds another investment that can be repeated and produces the same results. Defining number of days between stamp purchase and use as D, the standard formula for computing the annualised percentage rate of return, AR, is given by equation 3:

$$AR = \left\{ \left(\frac{FR_t}{CR_0} \right)^{\frac{365}{D}} - 1 \right\} * 100. \quad (3)$$

To demonstrate these computations, again consider a postage rate increase from \$0.42 to \$0.44 for a domestic first-class letter. If an individual purchases forever stamps prior to the rate increase and uses them ten days later, after the postage rates have changed, the individual will earn:

$$AR = \left\{ \left(\frac{0.44}{0.42} \right)^{\frac{365}{10}} - 1 \right\} * 100 = 446.29.$$

Thus, the consumer is earning a 446.29 per cent annualised return on the US\$0.42 that was invested in the stamp. The investor can compare this to an annualised cost of capital to determine the net present value of the project.

The above computations can be completed for any combination of the decision variables. Table 3 Panels A and B present computations for a starting rate of US\$0.42 and CD\$0.58 respectively. The columns present the results for rate increases of \$0.01 to

Table 2: Carry returns for permanent stamp purchases prior to postal rate increases

This table shows carry returns associated with purchasing permanent or forever stamps prior to a postal rate increase. Carry returns are computed as: $C_{0,t} = \frac{F_t}{CR_0} - 1$. Panel A shows returns based on USPS rates of US$0.42. Panel B shows returns based on CP rates of CD$0.58. Consumers with a cost of capital over the relevant time period lower than the indicated rate should purchase stamps.

Panel A: Carry Returns for USPS Rate Increases

		Future Postage Rate								
		0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.5
Current Postage Rate	0.42		2.38%	4.76%	7.14%	9.52%	11.90%	14.29%	16.67%	19.05%
	0.43			2.33%	4.65%	6.98%	9.30%	11.63%	13.95%	16.28%
	0.44				2.27%	4.55%	6.82%	9.09%	11.36%	13.64%
	0.45					2.22%	4.44%	6.67%	8.89%	11.11%
	0.46						2.17%	4.35%	6.52%	8.70%
	0.47							2.13%	4.26%	6.38%
	0.48								2.08%	4.17%
	0.49									2.04%

Panel B: Carry Returns for CP Rate Increases

		0.58	0.59	0.6	0.61	0.62	0.63	0.64	0.65	0.66
Current Postage Rate	0.58		1.72%	3.45%	5.17%	6.90%	8.62%	10.34%	12.07%	13.79%
	0.59			1.69%	3.39%	5.08%	6.78%	8.47%	10.17%	11.86%
	0.6				1.67%	3.33%	5.00%	6.67%	8.33%	10.00%
	0.61					1.64%	3.28%	4.92%	6.56%	8.20%
	0.62						1.61%	3.23%	4.84%	6.45%
	0.63							1.59%	3.17%	4.76%
	0.64								1.56%	3.13%
	0.65									1.54%

$0.04. The rows indicate the number of days from the time that the stamp was purchased until it is used. The results provide evidence that purchasing forever stamps prior to a postal rate increase is a sound investment for certain time periods. For a US$0.01 increase with a starting rate of US$0.42, if the stamps are purchased five days prior to use, the consumer earns a 457 per cent annualised return! It would be hard to replicate such a return with any other investment. Consumers should compare the return indicated in the appropriate cell of the table with their desired annualised rate of return to determine their own optimal purchase plan.

The rate of return earned becomes lower with each successive day that passes between purchase and use. For a 20-day purchase-use lag, the annualised return is 53.64 per cent. The return for a 90-day purchase-use lag is 10.01 per cent. Thus, a consumer that has a 10 per cent required rate of return should purchase about a 90-day supply of stamps immediately prior to a $0.01 increase in postage rates. Larger postage rate increases imply the consumer should purchase more stamps. The returns identified above apply to a single postal rate increase. In some instances the optimal purchasing pattern of permanent stamps may extend over multiple postal rate increases. In these cases, the consumers' return from

Table 3: Annualised returns to forever stamp purchases

This table shows the annualised return earned by purchasing forever or permanent stamps prior to postal rate increases. The columns indicate the increase amount from a starting point of US$0.42 in Panel A and CD$0.58 in Panel B. The rows indicate the number of days between stamp purchase and stamp use. The figure in each cell is the annualised percentage return from an investment in a forever or permanent stamp around postal rate increases.

Panel A: USPS Rates					**Panel B: CP Rates**				
	Rate Increase					**Rate Increase**			
Days	**$0.01**	**$0.02**	**$0.03**	**$0.04**	**Days**	**$0.01**	**$0.02**	**$0.03**	**$0.04**
5	457	2,884	15,293	76,481	5	248	1,088	3,870	12,912
10	136	446	1,141	2,667	10	86.63	245	530	1,041
15	77.28	210	436	815	15	51.58	128	241	407
20	53.64	134	252	426	20	36.61	85.65	151	238
25	40.99	97.23	174	277	25	28.35	64.04	109	165
30	33.15	76.12	132	202	30	23.12	51.05	84.70	125
60	15.39	32.71	52.15	73.92	60	10.96	22.90	35.91	50.04
90	10.01	20.76	32.29	44.62	90	7.18	14.74	22.69	31.06
120	7.42	15.20	23.35	31.88	120	5.34	10.86	16.58	22.49
150	5.89	11.99	18.28	24.78	150	4.25	8.60	13.06	17.62
180	4.89	9.89	15.02	20.26	180	3.53	7.12	10.77	14.48
365	2.38	4.76	7.14	9.52	365	1.72	3.45	5.17	6.90
730	1.18	2.35	3.51	4.65	730	0.86	1.71	2.55	3.39
1095	0.79	1.56	2.33	3.08	1095	0.57	1.14	1.70	2.25

advance purchases of permanent stamps is magnified.

While the returns identified above are attractive, there is a point when the return earned by purchasing permanent stamps is not sufficient to warrant making the investment. For example, in the case of a US$0.01 increase, purchasing a stamp for use two years hence produces a 1.18 per cent annualised return. Purchase for use three years hence results in a 0.79 per cent annualised return. For most consumers, this is not a sufficient return to warrant making the investment.

The returns noted in Table 3 should be interpreted with care. In order to earn a total return for the year that equals the annualised return, the consumer must be able to repeat the investment throughout the entire year. Consider the 105 per cent annualised return implied by a US$0.01 increase and 12-day lag. In order to earn the 105 per cent return, after the individual uses the stamp purchased, the individual would need to repeat the investment for each 12-day increment throughout the year. Of course, postal rates do not change with this frequency. Recall from Table 1 that historically postal rates increase at one year intervals or less frequently. Indeed, 1981 is the only year the USPS increased rates twice in a single year. CP has never increased rates more than once in a year. Because of this fact, the returns noted here are theoretical. Nonetheless, if the investor were able to find a similar investment, the indicated rates would be achieved.

The combined results suggest that for most individuals purchasing between 90

days and 730 days of postage needs prior to a US$0.01 rate change is optimal. These purchase amounts correspond to annualised returns ranging from 10.01 per cent to 1.18 per cent. In current markets few individuals would decline a relatively risk free return of 10.01 per cent. A small group of investors would likely find a 1.18 per cent relatively risk free return desirable.

As a practical matter, regardless of the annualised return earned, the number of dollars involved may not be sufficient to warrant the investment of time and effort. To examine this issue, the total dollars saved by purchasing forever postage prior to a rate increase is computed. Defining RC as the postal rate change in dollars, U, as the number of first-class stamps used by the consumer and P, as the days of postage that are purchased, the total dollars earned, TD, are computed as:

$$TD = RC * U * P.$$

To demonstrate the use of equation 4, consider a firm that uses 1,000 stamps per day. At a US$0.42 postage rate this amounts to US$420 of postage at current USPS rates. The firm purchases a 100-day supply of stamps immediately prior to a US$0.02 rate increase. The total dollars of savings are computed as:

$$TD = \$0.02 * 1{,}000 * 100 = \$2{,}000$$

The US$2,000 saving is of sufficient magnitude for many firms to warrant the time and effort to engage in the activity. Table 4 reports the computation of TD for various rate changes, postage use amounts and days of postage supplies purchased. Panels A, B, C and D report the results for $0.01, $0.02, $0.03 and $0.04 postage increases respectively.

The results indicate that under many scenarios, the dollar amounts involved are of sufficient magnitude to warrant the time and effort necessary to make the transactions. For larger companies that purchase a four-year supply of stamps, the savings can amount to US$146,000 or more depending upon the amount of postage used each day. Under some circumstances the dollar amounts involved may not be sufficient to warrant the investment of time and effort. These scenarios occur when the consumer uses a small number of stamps and purchases for fewer days. For example, for a US$0.01 increase, a consumer that uses ten stamps per day and purchases a 50-day supply has a total savings of US$5.

THE COST OF CAPITAL

In order to identify the appropriate cost of capital to use for comparison purposes any risks associated with the investment must be identified. There are four elements of downside risk associated with the advance purchase of stamps. The first risk is the possibility that the postal service would lower rates at some point in the future. While this is possible, it is highly unlikely given that this has only happened twice in USPS history. The most recent postal rate decrease in the USA was on 1st July, 1919. CP has never reduced its rates. In light of the current fiscal problems of the USPS the chance of a future rate decline is quite low.

A second risk is the physical destruction of the stamps. In the event that the purchaser loses the stamps, the stamps are stolen, the stamps are destroyed by fire, or otherwise become

Table 4: Total dollars saved

This table shows the total dollars saved by purchasing stamps prior to a rate increase. The total is computed as: $TD = RC*U*P$. RC is the rate change, U is the number of first-class stamps used and P is the number of daily postage use purchased. The figure in each cell is the total dollars saved by early purchase.

Panel A: Rate Increase $0.01						**Panel B: Rate Increase $0.02**					
	Daily Stamp Usage						**Daily Stamp Usage**				
Days	10	50	100	1,000	10,000	**Days**	10	50	100	1000	10,000
1	0.10	0.50	1.00	10.00	100	1	0.2	1.00	2	20	200
5	0.50	2.50	5.00	50.00	500	5	1.00	5.00	10	100	1,000
10	1.00	5.00	10	100	1,000	10	2.00	10.00	20	200	2,000
25	2.50	12.50	25	250	2,500	25	5.00	25.00	50	500	5,000
50	5.00	25.00	50	500	5,000	50	10.00	50.00	100	1,000	10,000
75	7.50	37.50	75	750	7,500	75	15.00	75.00	150	1,500	15,000
90	9.00	45.00	90	900	9,000	90	18.00	90.00	180	1,800	18,000
100	10.00	50.00	100	1,000	10,000	100	20.00	100.00	200	2,000	20,000
125	12.50	62.50	125	1,250	12,500	125	25.00	125.00	250	2,500	25,000
150	15.00	75.00	150	1,500	15,000	150	30.00	150.00	300	3,000	30,000
175	17.50	87.50	175	1,750	17,500	175	35.00	175.00	350	3,500	35,000
200	20.00	100.00	200	2,000	20,000	200	40.00	200.00	400	4,000	40,000
250	25.00	125.00	250	2,500	25,000	250	50.00	250.00	500	5,000	50,000
300	30.00	150.00	300	3,000	30,000	300	60.00	300.00	600	6,000	60,000
350	35.00	175.00	350	3,500	35,000	350	70.00	350.00	700	7,000	70,000
365	36.50	182.50	365	3,650	36,500	365	73.00	365.00	730	7,300	73,000
730	73.00	365.00	730	7,300	73,000	730	146.00	730.00	1,460	14,600	146,000
1,461	146.10	730.50	1,461	14,610	146,100	1,461	292.20	1,461.00	2,922	29,220	292,200

Panel A: Rate Increase $0.01						**Panel B: Rate Increase $0.02**					
	Daily Stamp Usage						**Daily Stamp Usage**				
Days	10	50	100	1000	10000	**Days**	10	50	100	1,000	10,000
1	0.30	1.50	3	30	300	1	0.40	2.00	4	40	400
5	1.50	7.50	15	150	1,500	5	2.00	10.00	20	200	2,000
10	3.00	15.00	30	300	3,000	10	4.00	20.00	40	400	4,000
25	7.50	37.50	75	750	7,500	25	10.00	50.00	100	1,000	10,000
50	15.00	75.00	150	1,500	15,000	50	20.00	100.00	200	2,000	20,000
75	22.50	112.50	225	2,250	22,500	75	30.00	150.00	300	3,000	30,000
90	27.00	135.00	270	2,700	27,000	90	36.00	180.00	360	3,600	36,000
100	30.00	150.00	300	3,000	30,000	100	40.00	200.00	400	4,000	40,000
125	37.50	187.50	375	3,750	37,500	125	50.00	250.00	500	5,000	50,000
150	45.00	225.00	450	4,500	45,000	150	60.00	300.00	600	6,000	60,000
175	52.50	262.50	525	5,250	52,500	175	70.00	350.00	700	7,000	70,000
200	60.00	300.00	600	6,000	60,000	200	80.00	400.00	800	8,000	80,000
250	75.00	375.00	750	7,500	75,000	250	100.00	500.00	1,000	10,000	100,000
300	90.00	450.00	900	9,000	90,000	300	120.00	600.00	1,200	12,000	120,000
350	105.00	525.00	1,050	10,500	105,000	350	140.00	700.00	1,400	14,000	140,000
365	109.50	547.50	1,095	10,950	109,500	365	146.00	730.00	1,460	14,600	146,000
730	219.00	1,095.00	2,190	21,900	219,000	730	292.00	1,460	2,920	29,200	292,000
1,461	438.30	2,191.50	4,383	43,830	438,300	1,461	584.40	2,922	5,844	58,440	584,400

not usable, the entire investment is lost. The user can control this risk to some degree by storing the stamps in a safe deposit box or other safe area.

When purchasing forever stamps the user must make an estimate about future stamp needs. There is risk that the investor miscalculates future postage needs. Overestimating postage needs implies a longer use pattern thereby lowering the returns achieved. This risk can be worked around. Users are free to resell stamps in the USA. Thus, if an investor over-purchases stamps, the desired return can still be achieved by selling the stamps to someone else at the new postage rate.

The final element of downside risk is the possibility that the relevant postal body ceases operations or fails to honour previously purchased postage stamps. Indeed, the USPS has experienced financial difficulties in recent years with declining mail volume and higher operating costs. Despite these challenges the USPS plays a critical role in the US economy. Thus, it is highly unlikely the USPS would cease operations or fail to honour previously purchased postage stamps.

One element of return enhancing risk is the possibility of subsequent postage increases. The purchaser of a two-year supply of forever stamps immediately before a rate increase might benefit from multiple postage increases. Postage rates are changed at somewhat regular intervals with annual adjustments being the norm. The purchaser's return will potentially be enhanced by subsequent postage increases.

Both downside and upside risks are present in the analysis. Chances of the downside risks occurring are remote. The upside risk while much more likely, comes into play primarily for longer-term purchasers of stamps. Thus, the authors recommend that users apply a discount rate approximately equal to the risk-free rate of interest to the cash flows associated with forever stamp purchases.

POLICY IMPLICATION

Treasury managers and postal services around the world can gain insights from the findings here. Permanent stamps simplify transitions to higher postal rates. Nevertheless, the application of a forever stamp postage policy implies an optimal postal rate increase pattern. Thus postal services should try to minimise these costs by analysing postal purchase patterns leading up to a rate increase to determine optimal rate increase patterns. The annualised return earned by the consumer represents an implicit cost to the postal service. Yet, as noted above, these costs might be offset by other benefits accruing to the postal service.

The USPS and CP issue forever stamps based on first-class postage rates. Yet, as noted above, these stamps can be used for any purpose. A consumer who wishes to mail a USPS small flat-rate box requiring US$4.95 of postage would be required to utilise 11 forever stamps plus a US$0.11 stamp. Rational consumers will indeed have motivation to use forever stamps for this service after a postal rate increase. Still, utilising 12 stamps on a single package increases printing and handling costs to the postal service without increasing revenues. The same principle can be applied to other postal products and mailing services, thereby reducing the cost of printing stamps. This might be done by issuing debit cards with prepaid postage with the relevant postage rates determined on

the date the debit card is purchased. The forever stamp concept might also be applied to metered mail. Larger firms that purchase postage for metered mail might be guaranteed the prevailing postage rate at the time of purchase. Large advance purchases might help postal services manage financial liquidity issues.

CONCLUSIONS

Forever and permanent stamps are a relatively new product of the USPS and CP. These stamps allow consumers to lock in postage rates for later use. Consumers have strong financial motivations to purchase the stamps prior to an increase in first-class postage rates. In this paper a model is developed to identify optimal purchases of forever and permanent stamps when a postal rate increase is forthcoming. The model computes the carrying return and annualised return earned by consumers who purchase the postage at a pre-change rate and use it after the rate change. The results indicate that for most individuals purchasing between 90 days and 730 days of postage needs prior to a $0.01 rate change the return is optimal. The exact amount depends upon the level of postage rates, the amount of the change and the consumer's discount rate. The optimal time to purchase the stamp is the day prior to a rate increase.

Consumers can use this work to identify optimal postage purchases. Postal services that do not have a permanent-type stamp can use the data here to analyse the desirability of developing permanent stamp products. Postal services that currently have permanent stamp products can use this information to optimally design their postal products and affect strategically optimal rate change paths. This paper is the first known academic research to analyse this issue. More research is needed to fully understand the implications of forever and permanent stamps for service providers and consumers. Specifically, modelling an increase of relative labour costs to process output mail using forever stamps that have to be physically adhered versus automated metered mail would prove useful. Added labour costs to adhere stamps may outweigh the cost savings noted in this paper.

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